FRD ACTIVITIES REPORT
August 2007

Research Programs

Urban Dispersion Program

The manuscript "Atmospheric Flow Decoupling and its Effects on Urban Plume Dispersion" is still under review at the journal Boundary Layer Meteorology. The manuscript "Plume Dispersion Anomalies in a Nocturnal Urban Boundary Layer in Complex Terrain" was submitted to the Journal of Applied Meteorology and Climatology. A draft manuscript "Probability Density Functions and Peak-to-Mean Ratios for Tracer Plumes in an Urban Boundary Layer" has been completed and was submitted for ARL review. (Dennis Finn, 208-526-0566)

Perfluorocarbon Tracer Analysis Development

PFT method development work focused on trying to resolve some of the technical problems being encountered. In addition to the PDCB chromatogram interference issue mentioned last month, we have experienced problems with excessively rapid drift in the baseline and in the response of the electron capture detector (ECD). Some of the symptoms were consistent with detector age and deterioration. Therefore, the existing ECD detector was replaced by a different (but still used) detector. Testing is ongoing but preliminary results suggest that this step has helped to stabilize the baseline and extend the available voltage range. We are still dealing with some response issues with the "new" detector but hope to resolve them by determining the optimum combination of flow, pressure, voltage, and attenuation adjustments. Due to these troubleshooting efforts, the monthly sample aging and stability tests were not conducted. (Dennis Finn, 208-526-0566, and Roger Carter)

Tracer Technology

A patent application for the Stepped Electric Field Detector (SEFD) was filed with the United States Patent and Trademark Office on August 24, 2007. This detector was developed at FRD during 2006 as part of our ongoing tracer technology development efforts. To date, only prototypes of the detector have been built and significant development effort is needed before it is ready for implementation. However, it should be possible to produce the SEFD for a fraction of the cost of existing detectors. The SEFD offers trace level sensitivity to some compounds and are much less sensitive to oxygen than electron capture detectors. It may find application in a number of different fields in addition to atmospheric tracer detection. (Roger Carter 208-526-2745, Shane Beard, Randy Johnson)

Tracer System Development

New data systems for the continuous tracer analyzers have been ordered. The current data systems are old enough that parts are no longer available, thereby making maintenance a problem. The new systems will be built around a microcontroller that features solid state data storage, no moving parts, lower power consumption, and a touch screen interface for the users. (Roger Carter 208-526-2745, Shane Beard, Randy Johnson)

Cooperative Research with DOE NE-ID (Idaho National Laboratory)

Emergency Operations Center (EOC)

The EOC was activated the afternoon of 07 August due to the start of a wildfire just south of the Critical Infrastructure Test Range Complex (CIT). Despite gusty winds, the wildfire was contained after burning only 10 acres. The cause of the fire is still under investigation. (Jason Rich, 208-526-9513, and Roger Carter)

The EOC was activated again a second time this month on 17 August due to a large wildfire. This fire was located on the SE corner of the INL and burned over 2,000 acres before being contained. The fire was started from lightning. Over 12,000 lightning strikes occurred across the region during a two-hour period that evening. FRD again provided timely short range forecasts during the 5-hour activation. (Jason Rich, 208-526-9513)

On 14 August the Annual Exercise was held at the EOC. A two-person team from FRD participated. No serious problems were encountered by the NOAA team during the exercise. This was the last EOC drill/exercise scheduled for this year. (Richard Eckman, 208-526-2740, and Randy Johnson)

NOAA INL Weather Center

Improvements are continuing to be made to the NOAA INL Weather Center (NIWC) page. FRD has received numerous inquiries during the last few months regarding real-time lightning data over the INL. As a result, we have now placed two lightning products (a map and table) onto NIWC. The color-coded map displays all of the lightning strikes that occurred over the past 60 minutes in a 20-mile area around the site. The table shows the distance the closest strike is to each of the eight main INL facilities within the last 5, 15, 30, and 60 minutes. Both the map and table are updated every 60 seconds. Due to the agreement with USPLN, the lightning data provider, only those within the INL domain are given permission to view the lightning products. (Jason Rich, 208-526-9513, Brad Reese, and Neil Hukari)

Mesoscale Modeling

Several changes were made to the WRF mesoscale model configuration at FRD to improve the performance of the system. The most important change was with the cloud microphysics option. Originally, the FRD setup used a detailed but rather slow microphysics option in WRF. Now,

this has been replaced with a more efficient option that still retains most of the important microphysics processes. This appears to save up to about a half hour in total run time for the model. The model initialization was also modified so that the microphysics variables available in the RUC model, which is used to provide the initial and boundary conditions for WRF, are used in the WRF initialization. (Richard Eckman, 208-526-2740)

Transport and Dispersion Modeling

FRD is continuing to investigate methods that can create 3D wind fields for use with HYSPLIT while taking maximum advantage of the local observations available in Southeast Idaho. In addition to the INL Mesonet, the NOAA MADIS system provides access to satellite-derived winds, rawinsonde soundings, aircraft observations, and other surface observations. Also, the Pocatello NEXRAD radar provides radial velocities and reflectivities that cover the atmosphere above INL. Ideally, all these data sources should be blended into dynamically consistent 3D wind field that accounts for the topography. The WRF-Var package that is part of the overall WRF modeling system is one program capable of performing this blending. It starts with a background wind field based on a model forecast (e.g., WRF, NAM, etc.) and then assimilates the available data to create an adjusted wind field.

The WRF-Var package has been installed at FRD with the intention of using the local 4 km WRF forecasts as the background. A MADIS account has also been established to provide access to most of the observations. WRF-Var is supposed to be able to use NEXRAD data, but this feature does not appear to be well documented in the current version. (Richard Eckman, 208-526-2740)

Relocation of the Roberts Tower

The property, on which the Roberts meteorological tower is located, has been sold. The new owners are in the process of building a home very near the tower and want the tower removed from their property. The Market Lake Wildlife Management Area owned by the State of Idaho is located 200 feet north of the current tower location and they have initially indicated that we can relocate to their property. We are presently working to get the permissions necessary to use the state property and the permission to route the power through the land owner's or Union Pacific's property. Contact has already been made with Union Pacific to use their land. If this becomes difficult, we will try to work with the new land owner. (Randy Johnson, 208-526-2129)

Collaborative Research

A manuscript commenting on a recent paper published in *Boundary Layer Meteorology* has completed the ARL review process and will be submitted to the journal shortly. (Richard Eckman, 526-2740)

Other Activities

Papers

Finn, D., K.L. Clawson, R.G. Carter, J.D. Rich, C. Biltoft, K.J. Allwine, J.E. Flaherty, and M.J. Leach, 2007: Atmospheric Flow Decoupling and Its Effects on Urban Plume Dispersion. Extended Abstract, Seventh Symposium on the Urban Environment.

Finn, D., K.L. Clawson, R.G. Carter, J.D. Rich, C. Biltoft, K.J. Allwine, J.E. Flaherty, and M.J. Leach, 2007: Analysis of Plume Dispersion, Decay, and Peak-to-Mean Excursions for Continuous Tracer Gas Releases in an Urban Core, Oklahoma City, JU2003. (In review at Boundary Layer Meteorology)

Finn, D., K.L. Clawson, R.G. Carter, J.D. Rich, K.J. Allwine, and J.E. Flaherty, 2007: Analysis of Plume Dispersion in a Nocturnal Urban Boundary Layer in Complex Terrain, Salt Lake City, URBAN 2000. (Submitted to Journal of Applied Meteorology and Climatology)

Finn, D., K.L. Clawson, R.G. Carter, J.D. Rich, C. Biltoft, K.J. Allwine, J.E. Flaherty, and M.J. Leach, 2007: Probability Density Functions and Peak-to-Mean Ratios for Tracer Plumes in an Urban Boundary Layer. (Submitted for ARL Review)

Safety

After the Electronic Technicians were trained in tower climbing and fall protection last month, it became clear that additional safety equipment is necessary in order to completely comply with OSHA requirements. According, the necessary fall protection equipment was placed on order this month.

The staff viewed a video on heat stress, by Digital 2000, Inc., at the month staff meeting on August 6th.

Donna Harris attended the INL Safety Team Meeting on the 15th of August. A program called the "Body Blueprint" was presented to aid in maintaining and improving employee health through strength training and stretches. Donna Harris was able to schedule the presentation to be given to FRD employees at the next staff meeting in September.

All office fire extinguishers were inspected and serviced on August 16th.

A FRD Safety team was established consisting of Shane Beard, Roger Carter and Donna Harris. The first meeting was held on August 23, 2007. The goals of the team include completing the FRD Health & Safety Manual and developing a procedure to meet all annual training requirements.

Donna Harris completed a data call from OAR on occupant emergency plans and procedures self-assessment on August 28th.

All FRD employees viewed the videos, required by the MASC Safety Review Committee after their June visit, by the August 31st deadline (Slips, Trips & Falls and Electrical Safety, both from Summit Training Source, Inc.).

Training

Randy Johnson, Tom Strong and Shane Beard attended forklift training at the site on August 21, 2007.